TITLE: CONTROL FOR MULTIPLE COMPARTMENT DISHWASHER

BACKGROUND OF THE INVENTION

This invention relates to multiple compartment dishwashers. More specifically, this invention relates to a control system for distributing power to compartments of a multiple compartment dishwasher.

Dishwashers have long been known. Conventional dishwashers have a single compartment for washing dishes and other items. In addition, multiple compartment dishwashers are also known. Multiple compartment dishwashers allow dirty items to be placed in one compartment while another compartment is being used to wash dishes. A multiple compartment dishwasher also allows smaller loads of dishes to be washed so that the dishwashing process is not as inefficient as if a small number of dishes were to be washed in a conventional single compartment dishwasher. Despite any advantage of multiple compartment dishwashers, problems remain.

One problem relates to operating multiple compartments at the same time. When in a dishwashing mode, each compartment has power requirements needed for driving a load. The load being the electrical load of a heater, wash motor, or other types of dishwasher component. If too many of these components are simultaneously drawing current then the total current draw can exceed that which is permissible which can result in damage to the system, the tripping of a fuse or breaker, and/or other undesirable or inconvenient effects.

A further problem relates to opening a first compartment while a second compartment is in operation. If there is an

electrical pathway between components in the first compartment and components in the second compartment, then it is possible for an AC signal to find its way to components in the second compartment; potentially activating the components in the second compartment. This is undesirable.

Therefore, a primary object of the present invention is the provision of an improved multiple compartment dishwasher.

A further object of the present invention is the provision of a multiple compartment dishwasher having multiple compartments which can be operated independently of one another.

A still further object of the present invention is the provision of a multiple compartment dishwasher having multiple compartments that can be operated simultaneously.

Yet a further object of the present invention is the provision of a multiple compartment dishwasher that does not exceed a rated current draw.

A still further object of the present invention is the provision of a multiple compartment dishwasher that avoids stray AC signals from one compartment affecting components in another compartment.

These and other objects, features, or advantages of the present invention will become apparent from the specification and the claims.

BRIEF SUMMARY OF THE INVENTION

The present invention relates to a multiple compartment dishwasher having a power limiting distribution control system. According to the present invention, a multiple compartment dishwasher has a housing with a first compartment for washing within the housing and a second compartment for washing within the housing. Each of the compartments has one or more dishwasher components, each having a power load when

activated. The power limiting distribution control system is operatively connected to each of the plurality of dishwasher components for managing the distribution of power. This provides for ensuring that power ratings are not exceeded even while both the first compartment and the second compartment are simultaneously washing dishes.

The power limiting distribution control system can include one or more electrical isolation circuits in order to protect against any effect of one circuit on another. The power limiting distribution control system of the invention provides for implementation using a single microcontroller to control power consumption. The present invention also provides for multiple microcontrollers, each microcontroller being associated with controlling power management within a particular compartment.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is an isometric view of a multiple compartment dishwasher according to the present invention.

Figure 2 is a diagram of a control system of a multiple compartment dishwasher according to the present invention.

Figure 3 is another embodiment of electrical control system for multiple compartment dishwasher according to the present invention.

Figure 4 is an electrical schematic showing a digital logic circuit for preventing simultaneous operation of two different components.

DETAILED DESCRIPTION OF THE INVENTION

The present invention provides for an improved multiple compartment dishwasher. Figure 1 shows an isometric view of a multiple compartment dishwasher according to the present invention. The multiple compartment dishwasher 10 has a

housing 11. Within the housing 11 is a first compartment 12 and a second compartment 14. The first compartment 12 and the second compartment 14 are both adapted for independently washing dishes or other items. For example, dishes can be placed in compartment 12 and washed while compartment 14 can remain available for loading. Similarly, the second compartment 14 can be washing dishes while the first compartment 12 can be open. In addition, the electrical control system of the present invention provides for both the first compartment 12 and the second compartment 14 to be simultaneously operating. In this manner, an operator can select whether to wash dishes in one of the compartments or both of the compartments. Preferably, the compartments are of different sizes. When the compartments are different sizes, a small load of dishes can be washed in the smaller of the compartments and a larger load of dishes can be washed in the larger compartments.

Figure 2 illustrates an electrical control system according to the present invention. In Figure 2, the electrical components associated with the first compartment 12 are shown as well as the electrical components associated with the second compartment 14. Other electrical components which are associated with both compartments are indicated by reference numeral 16. The first compartment 12 includes a microcontroller 18. This microcontroller communicates through isolation circuit 20 with electrical devices 22 having AC loads which are associated with the first compartment 12. This may include motors, heaters, solenoids, and/or other electronic devices used to activate nozzles, washer arms, and/or other parts. In addition, sensors 24 are electrically connected to the first compartment microcontroller 18. These sensors are adapted for various purposes associated with the first compartment 12. For

example, one sensor can be used as a motor current sense to detect whether a motor has failed or else is operating properly. Another sensor is a turbidity sensor used to detect the dirtiness of the water. Another example of a sensor that can be used is a thermistor, used to detect the temperature associated with the compartment 12. These examples of sensors are given only by way of example. The present invention contemplates any number of sensors that may be useful or desirable in the context of a particular design or application.

Similarly, the second compartment 14 includes a second compartment microcontroller 28. The second compartment controller is electrically connected to an isolation circuit 30 which is electrically connected to one or more AC loads 32 associated with washing within the second compartment 14. The isolation circuit, electrically isolating the control system from the AC loads 32 of the second compartment 14. Further, the AC loads of the first compartment are preferably isolated from the AC loads of the second compartment. Similarly, sensors 34 are electrically connected to the second compartment controller 28. The sensors may provide for various sensing operations including sensing motor current, turbidity, and temperature. The sensors can also provide for other sensing functions associated with dishwashing.

Both the compartment one controller 18 and the compartment two controller 28 are electrically connected to a communications bus. This allows the compartment one microcontroller and the compartment two microcontroller to communicate. In addition the user interface controller 36 may be electrically connected to the communications bus. These interface controller provides for controlling both user output 38 functions as well as user input 40 functions. User

output functions can include a display, audio feedback, and other types of output. The communications bus can be any number of buses including an I2C bus. Where an I2C bus is used then one of the controllers can be used as a master and the other controllers can be configured as slaves.

Figure 3 is another embodiment of the present invention. In Figure 3, a single controller 18 is used. The single controller 18 provides control both over compartment one AC loads 22 through an optional isolation circuit 20 as well as control over compartment two AC loads 32 through a second compartment isolation circuit 30. Preferably the isolation circuit is an opto-coupler so that separation of power can be controlled. The compartment controller 18 and a user interface controller 36 can communicate over the communications bus 26.

Figure 4 provides for a digital logic circuit used to control one or more devices. Using the logic circuit shown, a first control signal 50 and a second control signal 52 are shown for two different devices that should not be simultaneously operable. Where power is being managed with a microcontroller according to the present invention and in order to avoid exceeding any given power rating, only one of the two devices should be operable at a time. The first control signal is electrically connected to a first NOR gate 54. The NOR gate 54 can be a part of 74HCO2 integrated circuit or other NOR gate circuit or an equivalent. The first control signal 50 is electrically connected to both of the two inputs of the NOR gate 54. The second control signal 52 is electrically connected to both of the two inputs of the NOR gate 56. The output of the NOR gate 54 is electrically connected to one of the inputs to the NOR gate 58. The second control signal is electrically connected to the second input NOR gate 58. The output of this NOR gate provides for

a first enable signal 62. This enable signal can be used to enable or turn on a dishwasher component having a high current draw or high power requirements.

Similarly, the output from the NOR gate 56 is electrically connected to one input of the NOR gate 60. The first control signal 50 is electrically connected to a second input of the NOR gate 60. The second enable output 64 provides a signal that can be used to enable a second device having a high current draw or high power requirements. The control logic shown in Figure 4 ensures that both the output 62 and the output 64 are not both enabling at the same time. This is used to ensure that two components having high power requirements are not driven at the same time. The output 62 and 64 can be used to drive opto-couplers, the opto-couplers will enable allowing the AC load to be driven. Although this example is given in terms of NOR logic gates, the present invention provides for other combinations of digital logic to be used to implement the selection of one of a plurality of devices to be enabled at a time.

A multiple compartment dishwasher having a power limiting distribution control system has now been disclosed. The present invention contemplates variations in the number of compartments, the use of digital logic and/or microcontrollers and other variations within the spirit and scope of the invention.